# Validation of the Patient Roster in a Primary Care Practice

*John E. Anderson, Wendy A. Gancher, and Peter W. Bell*

*Knowledge of the size of a practice population is an essential base for the evaluation of new forms of health care delivery and for epidemiologic research in primary care. Remuneration to providers in Ontario's Health Service Organization and Health Centre programs is partially based on the number of people listed on the patient roster as members of the practice. However, the accuracy of these rosters has never been determined. A mail and telephone survey was conducted to validate the roster in one such health center. A random sample of 1,065 households was contacted and a 78 percent response rate was obtained. The practice roster showed a population of 3,134. The age- and sex-adjusted estimate from the survey was 2,964 ( $\pm 262$ ) individuals. The sensitivity, specificity, and accuracy of the roster were 0.90 or greater. It is concluded that this particular roster is a valid indicator of practice size, but caution is expressed about generalizing these results to other practices.*

New approaches to the delivery of primary care are being introduced in an effort to provide effective and efficient care in a manner suited to the providers and responsive to the needs of the population. This action is based on the belief that North America's traditional fee-for-service private enterprise system is not the best for all situations. The government of Ontario has established two such optional approaches to the provision of primary health care: the Health Service Organization (HSO) and the Health Centre (HC). While the vast majority of Ontario's medical services take place in a fee-for-service environment, these

John E. Anderson, M.D., C.C.F.P. is Professor and PSI Research Scholar in Primary Care, Department of Family Medicine, Queens University, Kingston, Ontario, Canada. Wendy A. Gancher, M.Sc. is a Research Assistant, and Peter W. Bell, M.D., C.C.F.P. an Assistant Professor, in the Department of Family Medicine at Queens University. Address all correspondence and requests for reprints to Dr. J. E. Anderson, P.O. Bag 8888, Kingston, Ontario K7L 5E9.

two programs are available as alternatives. Funding for both the traditional and innovative approaches is provided by the province's universal health insurance scheme, the Ontario Health Insurance Plan (OHIP).

The HSO and HC programs range across the spectrum of primary health care services. At one end of the spectrum, the HSOs tend to provide a more traditional style of physician service, while at the other end, the HCs provide a wider variety of primary care services — both medical and nonmedical. There is considerable overlap, however, between the programs in the midportion of this spectrum. While not functionally discrete, the programs are quite discrete administratively in that their funding sources differ greatly. The HSOs are financed on a capitation basis, while the HCs receive their remuneration in the form of a global budget [1]. In the former instance, payment is made as a fee per patient rostered (or registered) to receive services within the practice. In the case of HCs, the practice is paid to provide one or more defined services to a population, with the scope and nature of the services based on the needs and size of the recipient population.

Thus, the funding and evaluation of both HSOs and HCs must consider the size of the population being served. This is where the difficulty arises. The problem of determining the size of this population is the "most difficult challenge" to resolve in evaluating these service modes [2]. While HSOs and some HCs are required to maintain a list, or roster, of their patients, the accuracy of these rosters has not been determined. The difficulty of determining practice size has also been of concern to epidemiologic and clinical researchers in primary care, where both direct and indirect methods of determining practice size have been evaluated [3, 4], although no solution to this "denominator problem" has been found. Even if a solution is found, its usefulness will probably be limited to research within a single practice or to comparisons between practices. Since a practice population is nearly always a systematic sample of the community, observations from a practice cannot be generalized to the larger community [4, 5].

This article describes a survey that was undertaken to validate the patient roster of a health center in a small, rural Ontario community. Most previous studies of register accuracy had been conducted in the United Kingdom [6–10], although a few were reported from North America [11, 12]. These studies determined that list inflation is the major source of inaccuracy, although some deflation can occur as well. Inflation of the patient list arises when the practice does not recognize that patients have left the practice and maintains them on the register. They are, in essence, false positive entrants. Deflation of the lists

occurs when the practice fails to recognize and register individuals who are really part of the practice. Such individuals, so-called nonattenders, constitute a group of false negatives. Many of the previous studies are potentially biased in that they have involved only list inflation and have not dealt with the deflationary problem.

## STUDY PRACTICE

The study reported here was carried out in the Sharbot Lake Medical Centre, located in a lake-studded, heavily forested area of low population density in southeastern Ontario. The village of Sharbot Lake is approximately 25 miles from the nearest full-time alternative source of primary care and from the nearest source of secondary care. It is situated about 45 miles north of the tertiary care facilities of this health sciences center (Figure 1). The practice is manned by two full-time family physicians, augmented by a family medicine resident rotating through the practice. All of the support staff is clerical, although the local public health nurse has her office in the practice facility. Electrocardiographs are available on site. Most blood samples are sent to a regional laboratory by a scheduled courier service. The center has no x-ray facilities and is equipped to deal with only minor trauma. There is no pharmacy in the community and most medications are dispensed by the practice.

The practice is classed as a HC with a contract to provide services to any individual insured under OHIP. This includes tourists and other transients as well as local residents who attend other practices and the regular center-based patients. The group is only permitted to bill for services those patients not insured by OHIP. Despite this funding base, the Ministry of Health requires the practice to maintain a roster of its regular patients. Compilation of this roster began in 1976, in collaboration with the Ontario Ministry of Health (MOH). The roster was designed to be "a list of individuals who give explicit indication that they regard the [practice] as their central source of health services and who conform to patterns of utilization which are consistent with the registrant's expressed intentions" [2]. The procedure used in establishing and maintaining this roster (Figure 2) is heavily dependent on a personal knowledge of patients using the practice. Because of this well-established roster, and because of the relative geographic isolation, this practice was considered to provide an attractive site for a study of register accuracy.

Figure 1: Location of Study Practice (Sharbot Lake) in Relation
to Other Health Services
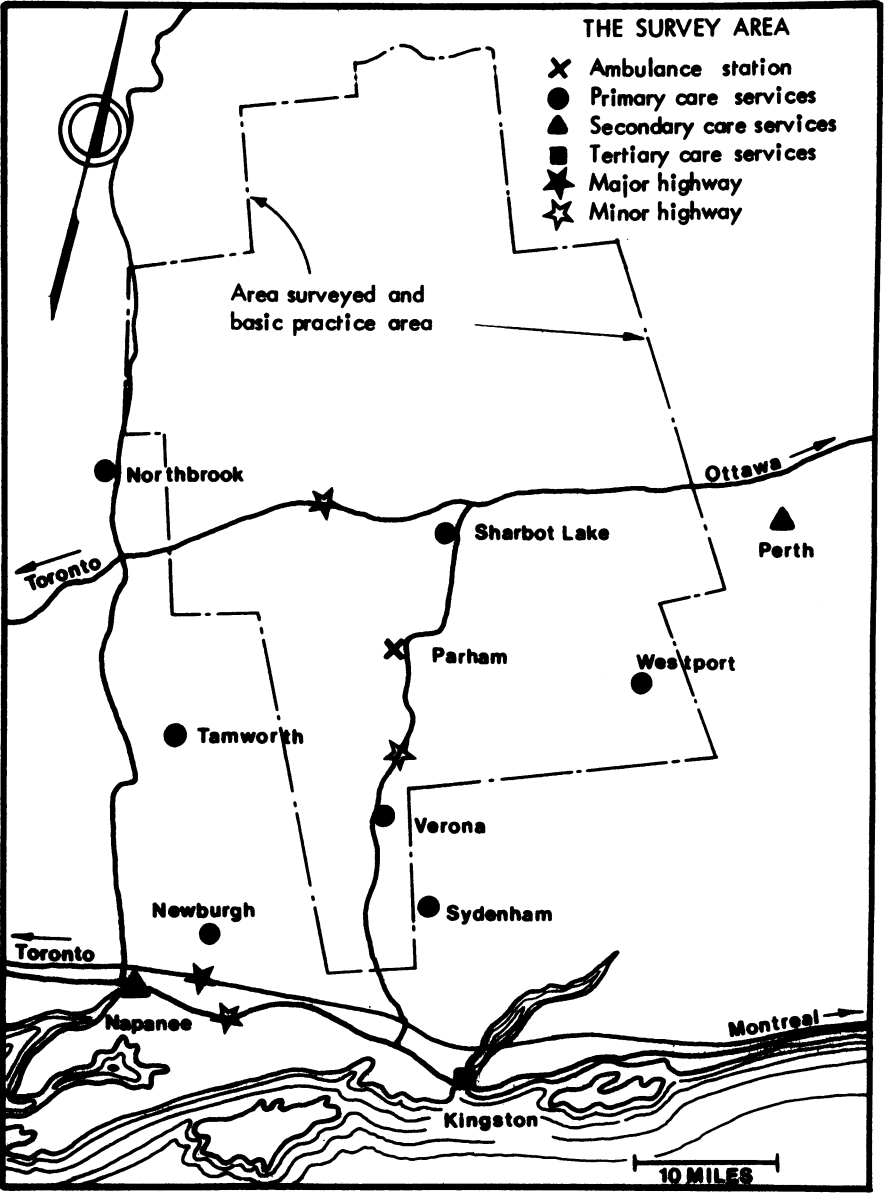
## Figure 2: Criteria Employed in Establishing and Maintaining the Patient Roster at the Sharbot Lake Medical Centre

ORIGINAL ROSTER DEVELOPMENT:

1. All patient records were reviewed by a staff member who had lived in the community and worked in the practice for several years.

2. Patients were included if their pattern of practice use was compatible with their known health status (e.g., those with significant health problems attended frequently).

3. Patients were excluded if not full-time residents, if known to visit other doctors, or if their pattern of attendance was not compatible with their health status (e.g., those with significant health problems who had abruptly stopped using the practice).

ROSTER MAINTENANCE:

1. New patients are specifically asked if they and other members of their family intend to use the practice as their source of care. Affirmative answers lead to roster entry of each family member who will be a regular patient. This enquiry is usually made at the first visit to the practice and always in the first two or three visits.

2. Patients are deleted from the roster only if there is specific information that they have moved, begun attending another practice, or died. No reviews of practice utilization are performed.

3. During the last 2 years all roster additions and deletions have been recorded on a standard transaction report provided by the MOH. These forms require the signature of each patient (or parent) for additions to the roster.

## METHODS

The study design was based on a survey of randomly selected households in the area served by the Sharbot Lake Medical Centre. The purposes of the study were (1) to estimate the size of the practice independent of the roster, (2) to validate the accuracy of the roster, and (3) to establish a standard by which other solutions to the denominator problem could be evaluated.
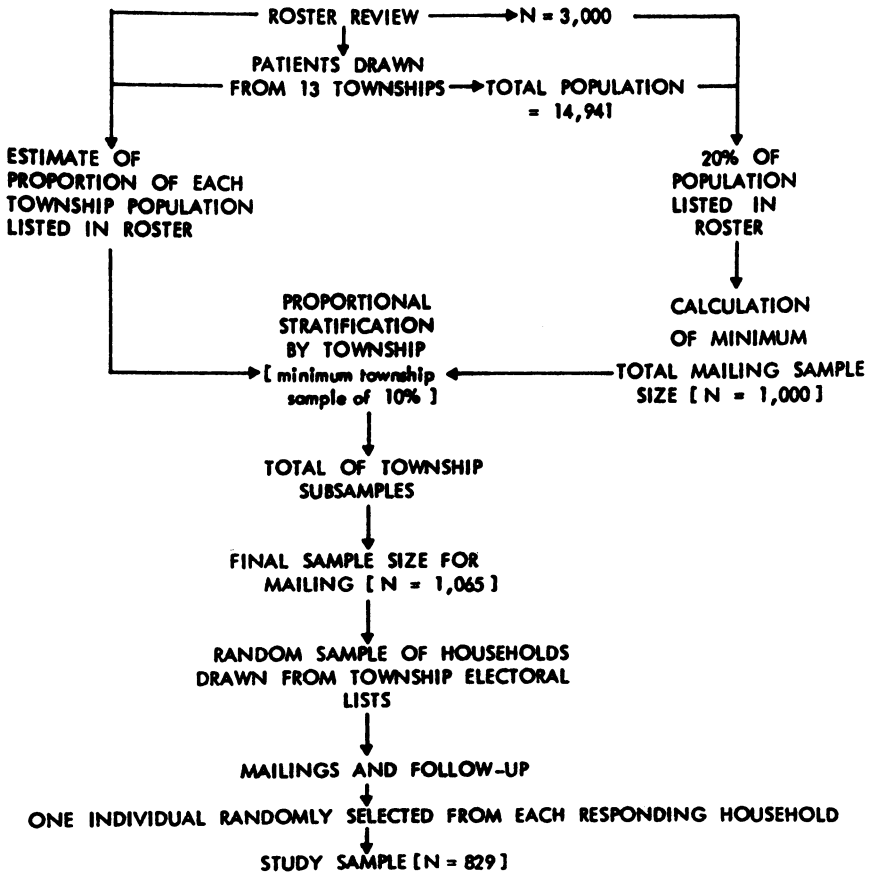
### SAMPLING

The method of drawing the sample is summarized in Figure 3. Examination of the existing roster indicated that the practice drew patients from 13 townships and served approximately 20 percent of the combined population of these townships. The minimum sample size was calculated assuming an 80 percent response rate and a 95 percent confidence limit of ± 2.9 percent on the estimated 20 percent propor-

tion. The total sample was stratified proportionately by township to ensure adequate representation. To prevent overrepresentation from a few families, the actual mailing sample was based on households. One member of each responding household was randomly selected to enter the study sample.

The number of households in each township was identified from the 1982 taxation assessment [13]. The sample from each township represented a minimum of 10 percent of households in that township.

Figure 3: Summary of Sampling Process

These calculations resulted in a sample size of 1,065 households for mailing. The sample of households was randomly drawn from the electoral list prepared by each township in October 1982. The electoral lists identified part-time residents so that they could be excluded from the sample. Owners, spouses, tenants, and others who were identified as full-time residents of the area were included. The members of any one household were identified by having the same lot description and mailing address.

SURVEY INSTRUMENT

A questionnaire was designed to ascertain the geographical location of the usual source of primary medical care of each individual in the household. In addition, age, sex, and the reasons for the most recent use of health services were collected for each individual in the household. Additional data were collected about their use of medical facilities other than the Sharbot Lake Medical Centre. The covering letter included a request that, where possible, the "woman of the household" complete the questionnaire with the assistance of the rest of the household members. This specification was included to achieve some degree of standardization in responses.

The instrument was piloted on a group of 50 patient households from a practice outside the survey area. These households were identified as being at a lower educational level and having a rural mailing address. Only minor revisions were indicated by this pilot. The design of the questionnaire and covering letter, as well as the general survey methods, followed guidelines that have been used successfully in previous studies [14, 15].

CONDUCT OF SURVEY

The questionnaires, accompanied by a self-addressed, postage-paid envelope, were first mailed in April 1983. A postcard reminder was mailed to the total sample 1 week later. Four weeks after the initial mailing, the questionnaire package was again mailed to nonrespondents, with a second postcard reminder sent out on the fifth week.

About 2 months after the initial mailing, a telephone follow-up of persisting nonrespondents was undertaken. Respondents not contacted by telephone after a second call were not pursued any further. The telephone questionnaire followed the same pattern as the written questionnaire. The purpose of the study was described in only very broad terms and without any mention of the Sharbot Lake Medical Centre.

Thus, the subjects were blind to the focus of the study, both in the mail and the telephone questionnaires.

ANALYSIS

The response rate was calculated, and one individual was randomly selected from each responding household for study. Age, sex, and health service utilization information on this individual was entered into a computer for further analysis. The age-sex distribution of the sample respondents was compared to that of the population of the survey townships as derived from the 1981 census [16]. Distribution of the sample population was also compared to the practice roster. Differences in population distributions were analyzed using a Chi-square test.

The proportion of the population of each township using the Sharbot Lake Medical Centre as its primary source of·care was estimated, and an age-sex-adjusted estimate of the total practice population was developed from these proportions. The sample of respondents was divided into "patients" and "nonpatients," based on their responses in the survey. This information was used as a gold standard for the validation of the roster, and the presence or absence of these individual names was noted on the roster itself. A 2 x 2 table was then constructed to determine the sensitivity, specificity, and accuracy of the roster in the usual fashion [17, 18]. The proportion of the population that was falsely rostered and the proportion that was falsely unrostered were then calculated, and these figures were used to estimate the size of the practice population using the formula shown in Figure 4.

# RESULTS

An overall response rate of 78 percent was achieved (Table 1). The response rates from individual townships ranged from 70 to 86 percent. The townships immediately around Sharbot Lake tended to have higher-than-average response rates. The survey population differed significantly both from the population of the townships and from the practice roster at the midpoint of the survey. The latter two populations did not differ significantly ($p > 0.995$), indicating that any difference between these two could well be attributed to chance. The major difference between the survey-respondent population and the other populations was in an overrepresentation of adult females and a corresponding underrepresentation of males and younger females (Table 2).

Figure 4: Method of Estimating Practice Size
Using Estimates of the Population Proportions
that are Falsely Registered and Falsely
Unregistered

|  | *Survey* | |
| --- | --- | --- |
| *Roster* | *Patient* | *Not Patient* |
| Listed | a | b |
| Not listed | c | d |

Estimate = nr + PcN - PbN

where

$N$ = total population of townships
$nr$ = population on practice roster

$$Pb = \frac{b}{\text{number in sample}} = \text{proportion of respondent sample who are rostered but claim not to be patients in the practice}$$

$$Pc = \frac{c}{\text{number in sample}} = \text{proportion of respondent sample who are not rostered but claim to be patients in the practice}$$

At approximately the midpoint of the survey, the practice roster numbered 3,134 individuals. The age- and sex-adjusted estimate of the practice size was 2,964 with a 95 percent confidence range of 2,702-3,226. The sensitivity of the roster was determined to be 0.90, while the specificity was 0.94 and the accuracy 0.93 (Table 3). Because of the disparity between the survey and the total population, the validity of the roster was determined on a sex-specific basis and found to be high in both cases (Table 4).

## DISCUSSION

The practice roster fell well within the confidence limits of the survey estimate, and it had high levels of sensitivity, specificity, and accuracy. Thus, it would appear to be a valid measure of the practice population. A part of the apparent inflation of the roster may be due to a very few households, which, although outside the survey area, are entered in the roster. (These households were not included in the determination of the roster's validity.)

These results are considered reliable, despite the dissimilarity between the respondent sample and the community populations. The

Table 1: Distribution of Responses
in the Survey

|  | *Number* | *Percent* |
|---|---|---|
| Mail responses | 576 | 54.1 |
| Telephone responses | 253 | 23.8 |
| Nonrespondents | 236 | 22.2 |
|  | 1,065 | 100.1 |

Table 2: Comparison of the Expected and Observed Age-Sex
Distribution of the Study Sample, with the Expected Number
Calculated from the Population of the Surveyed Townships

|  | *Males* | | *Females* | |
|---|---|---|---|---|
| *Age Group* | *Expected* | *Observed* | *Expected* | *Observed* |
| 0–4 | 26.3 | 10 | 24.8 | 7 |
| 5–14 | 60.4 | 31 | 55.7 | 30 |
| 15–24 | 68.1 | 35 | 61.1 | 43 |
| 25–44 | 106.0 | 45 | 96.8 | 172 |
| 45–64 | 83.6 | 68 | 82.8 | 179 |
| 65 + | 52.6 | 45 | 55.7 | 109 |
|  | 397.0 | 234 | 376.9 | 540 |
| *Totals*\* |  |  |  |  |
| Expected | 773.9 |  |  |  |
| Observed | 774.0 |  |  |  |

\*55 respondents did not provide age.

age and sex adjustment of the data should have overcome any inherent bias. The atypicality of the sample population might have arisen because of failure of the randomization process to identify appropriate households or household members, or both. It is also possible that the response rate was selectively lower from larger and thus busier families. This would account for some of the underrepresentation of children and adolescents. Since the questionnaire asked that the "woman of the household" respond, it may be that some of the women who responded for themselves responded less completely for other members of the household. This would have created an overabundance of adult female respondents in the pool from which the study sample was drawn. It is notable that it is adult females who are overrepresented in the sample; this is precisely the population group that has the highest level of service utilization. It is possible that males did not respond

Table 3: Comparison of Actual Listings
on the Practice Roster with Survey
Responses

| | Survey | | |
| Roster | Patient | Not Patient | Total |
|---|---|---|---|
| Listed | 212 | 35 | 247 |
| Not listed | 25 | 557 | 582 |
| Total | 237 | 592 | 829 |

$$\text{Sensitivity} = \frac{212}{237} = 0.90$$

$$\text{Specificity} = \frac{557}{592} = 0.94$$

$$\text{Accuracy} = \frac{212 + 557}{829} = 0.93$$

Table 4: Sex-Specific Validity
of the Practice Roster

| | Male | Female |
|---|---|---|
| Sensitivity | 0.89 | 0.90 |
| Specificity | 0.93 | 0.95 |
| Accuracy | 0.92 | 0.93 |

because they had not required a physician and had not identified a regular source of care. Unfortunately, the questionnaire did not explicitly provide for a response indicating that the individual did not have a regular doctor. It is, therefore, possible that such individuals simply did not respond. The fact that the roster's validity was virtually as high for males as for females suggests that this response phenomenon did not unduly bias the results. The level of agreement between the two estimates, derived in entirely different fashion, lends further credence to the survey's outcome.

While the roster in this practice is valid, this conclusion cannot be generalized to similar registers in other practices, even those in HSOs and HCs. The amount of effort involved in maintaining rosters has been described previously [19, 20] and, aside from the staff's dedication to the task, the practice examined here has several advantages in monitoring its patient list, although there is no direct financial incen-

tive. The staff is in more frequent contact with patients because of the dispensing done by the practice. This source of information is augmented by the close social contact and "grapevine" of a small community, and by the very close working relationship of the practice with social and public health agencies in the area. All of these sources provide information on deaths and transfers in the rostered population and assist in preventing undue inflation of the patient list. Roster accuracy probably is related inversely to the number of new and exiting patients — the more stable the population, the more accurate the roster. No figures are available for the setting studied here, but its geographic isolation probably limits the transfer of patients to other practices in the area, and it is possible that the population's turnover is somewhat below the Ontario average. Both of these factors would enhance the stability of the practice population and thus the accuracy of the register.

While the results may not be generalizable, they do indicate that an assiduously maintained roster can be accurate. They also indicate that this practice, because its population is accurately enumerated, may be used as a laboratory for testing proposed solutions to a part of the denominator problem in primary care research — the part dealing with the size of the regular or full-time patient population. Estimation of the size and relative significance of the part-time population within a practice is a separate question [21, 22] that will require discrete studies of the sorts of patients specifically excluded from the Sharbot Lake roster.

## ACKNOWLEDGMENTS

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